

REMARKS

Claims 1-9 are pending in this application. By this Amendment, 1-5, 7 and 8 are amended and new claim 9 is added. No new matter is added. Claim 1 has been amended to include a feature from claim 4. Claims 5 and 8 have been amended to include the features of claim 1 and to add additional features. Claims 2-4 and 7 have been amended to provide proper antecedent basis for various terms and to make other terms consistent with the independent claims. Support for the change to claim 5 may be found, for example, in the first full paragraph on page 5. Support for the change to claim 8 may be found, for example, in the last paragraph on page 5 and continuing to page 6. Support for new claim 9 may be found, for example, in the last paragraph on page 4 and continuing to page 5.

The Office Action indicates that the PTO 1449 forms submitted with the Information Disclosure Statements filed December 29, 2005, March 17, 2006 and October 6, 2006 have not been received by the Patent Office. Applicant provides a copy of each of these PTO 1449 forms along with its associated Patent Office Receipt as Attachment 1 to show that these documents were timely filed.

Claims 2-4 stand rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite because "the weight ratio of ion exchange resin and carbon carrier" allegedly lack antecedent basis. Claim 2 has been amended to recite that both the hydrogen electrode-side catalyst layer and the air electrode-side catalyst layer each include ion-exchange resin and carbon carrier to provide proper antecedent basis for a weight ratio of these two components. Withdrawal of this rejection is respectfully requested.

Claims 1-2, 5 and 8 stand rejected under 35 U.S.C. §102(b) over Imahashi et al., U.S. Patent No. 5,350,643. Claims 3, 4, 6 and 7 stand rejected under 35 U.S.C. §103(a) over Imahashi as applied to claims 1-2, 5 and 8. These rejections are respectfully traversed.

Claims 1-4 and 9 are directed to a fuel cell having at least a membrane electrode assembly comprising an electrolyte membrane in which the porosity in the hydrogen electrode-side catalyst layer is lower than the porosity in the air electrode-side catalyst layer. Claim 1 further recites that "the volume of pore space of the hydrogen electrode-side catalyst layer accounts for 1.0% to 3.0% of the total volume of the catalyst layer."

The Office Action specifically notes that Imahashi does not teach the above specific pore volumes. (*See* Office Action page 6.) Therefore, Imahashi does not anticipate claims 1-4 and 9.

With respect to the §103(a) rejection, Imahashi teaches away from this particular pore space volume by stating "the porosity has a proper range and according to investigation by the inventors this is preferably about 35 to 60% for the hydrogen electrode and is about 40 to 65% for the oxygen electrode." (See Imahashi, col. 6, lines 44-48; emphasis added). Applicant respectfully submits that "porosity" being referred to by Imahashi in this sentence is equivalent to the volume of pore space as a percentage of the total pore space volume of the particular electrode. As such, the incorporation of the specific pore volume space as recited in claim 1 would not be obvious from Imahashi. Withdrawal of both the §102(b) and §103(a) rejections of claims 1-4 and 9 is respectfully requested.

Claims 5-7 are also directed to a fuel cell having at least a membrane electrode assembly comprising an electrolyte membrane in which the porosity in the hydrogen electrode-side catalyst layer is lower than the porosity in the air electrode-side catalyst layer. Claim 5 further recites that "the hydrogen electrode-side catalyst layer contains an additive having a particular diameter sized to fill a plurality of voids in a carbon carrier included in the hydrogen electrode-side catalyst layer so as to lower the porosity of the hydrogen electrode-side catalyst layer."

Imahashi teaches the use of fluorocarbon polymers such a polytetrafluoroethylene (PTFE), graphite fluoride or mixtures thereof for use as the water repellent compound. (See col. 4, lines 28-32.) Because these compounds are large carbon-based polymers, Applicant respectfully submits that the Imahashi compounds are not particles "sized to fill a plurality of voids in a carbon carrier." As such, Imahashi does not anticipate claims 5-7. Moreover, because these compounds function differently due to their nonionic nature and hydrophilic/hydrophobic ends and they are used for a different function (waterrepellency), a person skilled in the art would not be motivated by Imahashi to use a small particle that fills the voids of the carbon carrier. Withdrawal of both the §102(b) and §103(a) rejections of claims 5-7 is respectfully requested.

Claim 8 is also directed to a fuel cell having at least a membrane electrode assembly comprising an electrolyte membrane in which the porosity in the hydrogen electrode-side catalyst layer is lower than the porosity in the air electrode-side catalyst layer. Claim 8 further recites that the electrolyte membrane includes a sprayed hydrogen electrode-side catalyst layer formed on one side and a non-sprayed air electrode-side catalyst layer formed on the other side.

Imahashi does not teach or suggest an electrolyte membrane having a sprayed hydrogen electrode-side catalyst layer and a non-sprayed air electrode-side catalyst layer. Imahashi does not teach or suggest a structural difference between the two catalyst layers. Moreover, Imahashi does not teach or suggest that different application techniques can be used to achieve this structural difference between the hydrogen and air catalyst layers. As such, Imahashi does not anticipate claim 8.

Furthermore, the features of the presently claimed invention provide unexpected results from the structural differences achieved by using a spraying method to form the hydrogen catalyst and a transfer method to form the air catalyst, as shown in Figs. 4 and 5 of

the present application. In view of these unexpected and surprising results and the lack of any suggestion or motivation within Imahashi that these results can be achieved from a sprayed hydrogen electrode-side catalyst layer and a non-sprayed air electrode-side catalyst layer, claim 8 is not obvious in view of Imahashi. Withdrawal of both the §102(b) and §103(a) rejections of claim 8 is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-9 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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JAO:LES/ccs

Attachments:

December 29, 2005 PTO-1449 and PTO date-stamped receipt
March 17, 2006 PTO-1449 and PTO date-stamped receipt
October 6, 2006 PTO-1449 and PTO date-stamped receipt

Date: April 5, 2007

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